

## Analysis Of Physics Books For The Preparatory Stage In The Light Of The Principles Of The Theory Of Creative Problem Solving Triz

Muhsen Taher Muslem Al-Mousawi, Maryam Khudair Farhan

Article Info	Abstract
<p><b>Article History</b></p> <p>Received: June 28, 2021</p> <p>Accepted: January 29, 2022</p> <hr/> <p><b>Keywords :</b> Asymmetrical Structure, Code-Switching, Content Morphemes, System Morphemes, Matrix Language Frame Model, Urdu-English Codeswitching</p> <p><b>DOI:</b> 10.5281/zenodo.6335004</p>	<p><i>Our current era is characterized by scientific and cognitive progress and the acceleration of the information revolution. Creativity is a path of progress, so that all activities are characterized by intense competition, continuous change, increasing challenges, and increasing dependence on the knowledge economy that has played a prominent role in the contemporary world, and because creativity in solving problems is an important source for facing challenges and achieving progress. Prosperity in various fields, and its application in various aspects of life, especially in light of the urgent need to address various issues in new creative ways, in order to achieve the distinction of its users among other things, has become a creative solution to important areas of interest to the work of researchers and educators. And perhaps the most important theories. The application developed in this field is the TRIZ theory. TRIZ) to solve problems in a creative way, and since the textbook is one of the most important tools of the curriculum and the most influential in the educational situation, so it was necessary for the content of books, including physics books for the preparatory stage, to be constantly examined and analyzed to keep pace with everything new, to raise and develop students' abilities, including their ability To solve problems in a creative way because the scientific content of physics books must take into account recent trends including principles from TRIZ. A huge amount and a problem that generates media difficulty and then increases the complaint among students, and there is a weakness in the interpretation and answering the questions posed by the study material or by the students so that they do not include any creativity, but short and superficial answers that do not explain the ability or ability of students to be creative in solving the physical problem. This was confirmed by the researcher through the questionnaire she submitted to a group of (10) specialized supervisors and physics teachers in middle schools in the Directorate of Education in Thi-Qar Governorate, Annex No. 1, and the exploratory questionnaire revealed a number of closed questions.</i></p>

### Introduction

**The results of the answer to the questionnaire presented are as follows**

1. Percentage 70 %do not have an accurate knowledge of the principles of creative problem solving theory TRIZ.
2. Percentage 60 %that the curricula of physics textbooks for the preparatory stage did not indicate any evidence of the inclusion of the principles of the theory of creative problem solving TRIZ.
3. Percentage 60 %There is a decline in including the principles of creative problem solving theory TRIZ in physics books

However, these objections remain categorically unconfirmed unless a solid scientific research follows that based on monitoring and examining physics books, and based on that, the researcher may conduct a scientific research on the extent to which physics books for the preparatory stage include the principles of TRIZ theory for creative solution to problems TRIZ.

**From the above, the problem of the current research is determined by the following question**

**Q/ to what extent do physics books for the middle school include the principles of the theory of creative problem solving? TRIZ?**

**Research importance**

**The importance of the current research is reflected in the following**

1. The mentors and those concerned with the development of curricula and curricula at the Iraqi Ministry of Education benefit from it, which contributes to the development of creativity to solve problems by

highlighting the importance of including the principles of the theory of creative problem solving TRIZ in physics books for middle school .

2. In line with modern global trends that call for the need to pay attention to the development of thinking skills of all kinds, including creative problem solving .
3. The current research seeks to provide an objective criterion for analyzing physics books for the preparatory stage according to the principles of TRIZ theory for creative problem solving .
4. To the knowledge of the researcher, this research is the first in Iraq that dealt with the topic of analyzing physics books for the preparatory stage in the light of the principles of TRIZ theory for creative problem solving TRIZ which could be a starting point for other researchers in developing creative problem solving skills .
5. The content analysis has a scientific value because this type of studies provides an opportunity to develop the curriculum, and to reveal its strengths and weaknesses .
6. The Iraqi scientific library is supplied with literature and theoretical concepts about the research variable (solution theory creative problem TRIZ).

#### **Research aims**

The current research aims to identify the extent to which physics books for the preparatory stage include the principles of the theory of creative problem solving (TRIZ)

#### **Research limits**

1. Physics book for the fourth scientific grade ,the tenth edition of the year 2019 NS.
2. Physics book for the fifth grade scientific applied seventh edition for the year 2019 m
3. Physics book for the sixth grade scientific applied seventh edition for the year 2019

#### **Some principles of creative problem solving theory TRIZ.**

After the questionnaire was presented and presented to experts and specialists in physics teaching methods, the experts and specialists agreed to take some principles of creative problem-solving theory. TRIZ In keeping with the topics of Physics for middle school, experts and specialists (20) one of the principles of TRIZ theory and these principles are:

1. The principle of division: This principle is used to solve problems by dividing the system into several parts or by designing the thing so that it is indivisible. The system is either partitioned as a precondition that can increase the degree of fragmentation or division.
2. The principle of separation (extraction) Solves problems using this principle by identifying components that work well and working on them Develop and identify harmful and useless components.
3. Principle of spatial quality local quality: This principle refers to the solution of improving the problems facing the system through the quality of performance in its various parts by changing the internal and external environment of the system.
4. The principle of linking and combining / merging: This principle includes the spatial or temporal connection between systems that perform similar or contiguous operations, and this principle expresses the set of things.
5. After the principle of dynamism (flexibility) This principle involves designing an object, its properties, its external structure, or the processes it performs so that it can be To change it to find the best working conditions and to divide the thing into parts so that each of them is able to move and make inanimate things subject to modification or movement.
6. The principle of universality: This principle involves making the system capable of performing many functions or tasks, or making each part of the system capable of performing as many functions as possible, thus reducing the need for other systems.
7. Principle of pre-trial countermeasures: This principle is used in problem solving when it is necessary to take positive and negative influences, since in this case it becomes important to take countermeasures to control adverse effects.
8. Principle of Pre-Trial Procedure - Preliminary Procedure: This principle refers to implementing the required changes in the system, in part or in whole, before the actual need arises, and arranging things in advance so that they can be used from the most appropriate situation to avoid wasting time which can happen due to lack of these things in proper place.
9. The principle of pre-confrontation and a cushion in advance: This principle involves compensating for the relative decline in the reliability of a particular system by taking measures to address these problems before they occur.
10. The principle of equal voltage (variance reduction) This principle is used to solve problems by minimizing changes in the work environment or Its external environment, terms or conditions, and this also includes making limited changes to the job.
11. The principle of another dimension after another: Through it, problems can be solved by converting the motion in which the object moves in a straight line into motion in a two- or three-dimensional field and

by using objects consisting of several layers instead of using objects of one layer and finally tilting the object to its side and not just using objects in the same direction only.

12. Periodic work: This principle involves using the intermittent or intermittent method of work instead of continuous work, and if the work is periodic or intermittent in advance, the amount of intermittent work is changed or repeated. Finally, periods of downtime or interruption of work can be used to perform other work.
13. Continuing to do useful, purposeful, useful work: This principle includes making all parts of a thing or system work continuously and without stopping at their full potential and its production capabilities while eliminating completely unnecessary overlapping movements or sub-systems.
14. The principle of jumping or rushing at the speed of skipping: This principle involves executing the specified processes or phases very quickly, as well as fixing harmful or harmful processes that have risks very quickly as well. Fifteenth: Transformation is harmful into a beneficial blessing in disguise: This principle includes the use of harmful elements or influences in the environment to obtain the effects and the disposal of harmful positive elements by adding them to other harmful elements. In some cases, the damage or the effects from it can be increased until it becomes beneficial.
15. The principle of feedback: This principle involves providing feedback to improve processes or procedures, and if feedback is already available, its amount and impact can be changed.
16. Principle of mediator (mediation) This principle involves the use of an intermediary system or process to perform work or the temporary merging of one thing or system with another to achieve a specific goal, provided that the thing or system is easily restoreable to what it was before the merger.
17. Principle of Self-Service Self-Service: This principle involves making the system able to serve itself by performing auxiliary functions, using wasted resources, and wasted materials and energy. This principle can be used to solve problems by designing and developing the system so that it is able to perform the maintenance and support operations necessary to help the system continue to operate.
18. Thermal expansion: This principle refers to the property of material expansion by heat or cold contraction, as well as the use of different materials with different thermal expansion coefficients.
19. The principle of changing properties changes parameters: This principle involves changing the physical state of an object or system to a gaseous, liquid, or solid state, and changing its temperature
20. Concentration or cohesion, change of degree of elasticity, and finally change of temperature. (Aysara, 2015, 11).

### **The Terms of Definition**

#### **First :Content Analysis**

(Webster 2005 is to break everything down into its component parts or component parts (Webster: 2005,77)It is well-known (Al-Adwan and Al-Hawamdeh, 2011), and it is related to fragmenting and dismantling the content and extracting what is in it from facts, concepts, principles, theories and ideas (Al-Adwan and Al-Hawamdeh, 2011, 91)It agrees with the definition of (Al-Adwan and Hawamdeh, 2011) in defining content analysis theoretically because it is consistent with the objectives of this thesis.

#### **Researchers define procedural content analysis as**

Fragmentation of the content of physics books for the secondary stage into its primary elements on the extent of its comprehensiveness the content of the principles of TRIZ theory in creative problem solving that the researcher presented to the current research through the standard prepared for this purpose.

#### **Second: TRIZ Theory**

And he defined it (Ahmed Al-Mashikhi, 2009) as: a knowledge base technique that includes a rich set of methods for solving problems. The strength of this theory may stem from its reliance on successful systems development, as well as its ability to overcome psychological obstacles and generalize the methods used in advanced number solving. (Presbyterian, 2009, 1)It was defined by Zhuang et al. Chuang et al, 2010 is: a problem-solving method that increases the ability to solve problems in a creative way, and is based on the analysis of knowledge used in technical areas. (20Chuang et al, 2010)

#### **Third: Principles of TRIZ Theory**

Referenced by Kitty (2012): It is about forty principles that Chiller came up with by documenting patents while working as a mechanical engineer in the Soviet Army. (Kitty, 2011, 233)The well-known Belfort (Belfior, 2008) is a set of abstract rules that can be used to solve any problem. Claes and Ives (Cleese and Ives, 2008) stated that the Forty Principles are resources for creative problem solving. (Siyam 2013, 51)

#### **The researcher knows it procedurally**

It is a set of principles developed by the TRIZ theory of creative problem solving in which the researcher has built a standard by which middle school physics books can be analyzed to determine the extent to which these books contain the principles of creative problem theory. TRIZ solution.

#### **Chapter Two: Previous Studies**

1. (Forgiveness Study 2020) This study aims to analyze the physics books for the preparatory stage according to the nano concepts and the concepts of renewable energies. Physics stage for preparatory

classes (fourth scientific, fifth scientific application, biological - sixth scientific for the applied and biological branches) scheduled for the academic year 2019-2020.

2. Studying the Age of Patience (2020) This study aims to analyze the content of physics textbooks in secondary schools according to STSE secondary school standards, To achieve this goal, the researcher used the descriptive analytical method.
3. (Marwan Al-Khalidi study 2017) Al-Khalidi's study aimed to identify the extent to which physics books for the preparatory stage contain cognitive economy skills and the extent to which teachers possess physical skills with knowledge economy skills, where the researcher used the descriptive analytical approach.
4. The study (Iman Al-Ruwaithi 2001) This study aims to analyze the content of the physics curriculum at the secondary stage for girls in the Kingdom of Saudi Arabia The Kingdom of Saudi Arabia, where the researcher followed the descriptive approach, and the study revealed that the dimensions of technical enlightenment were not achieved to a large extent in the content, as it included (44) technical applications out of the total (120). It has been applied in the list by) (36.6%) The cognitive dimension inappropriately focused on not achieving the minimum level of technical knowledge and neglecting the skill, moral and emotional dimension.

### Chapter Three :Research Methodology and Procedures

#### Search procedure :Method of the Research

In this chapter, the researcher deals with an accurate description of the research procedures in relation to the process of analyzing science and physics books for the secondary stage in the light of the principles of TRIZ theory for creative problem solving .TRIZ ,starting with the selection of data sources, building the research tool, its validity and reliability, and the statistical methods used that were used in order to achieve the goal of the research .

#### First :Research Methodology :Curriculum of the Research

The researcher adopted the analytical descriptive research method using the content analysis method to analyze science and physics books for the secondary stage ,which is one of the survey methods used in the descriptive approach, as it fits with the research problem and the nature of the sample. The appropriate analysis tool with the nature of the data subject to analysis (Mayring, 2014, 39)

#### Secondly: research community :Population of Research

The process of identifying the research community is an essential step, on which the success of the study depends, especially in educational research. 2001, 184 A researcher defines his research community by his research topic or problem, and a community is a set of clearly identified people or documents. (2013: 309), and the current study population consists of all physics books for the preparatory stage for the year (2020-2021)

Table (1) Research community

The number of chapters of the book	total number of pages	edition	The title of the book	NS
9	188	NS10 -2019	Physics for fourth grade science	1
10	248	NS 8-2019	Physics for the fifth grade science	2
10	312	NS8 -2019	Physics for the sixth grade science	3
29	748	total summation		

#### Third: The research sample: The research sample

The research sample represents a part of the community chosen by the researcher according to common characteristics and within specific rules where it is representative of the characteristics of the original community, as it is difficult for the researcher to conduct his analyzes on the original community as a whole (Atifa2002 , 389)

Table (2) Research Sample

The number of chapters of the book	Number of pages excluded	The number of parsed pages	total number of pages	edition	The title of the book	NS
9	30	158	188	NS10 -2019	Physics for fourth grade science	1
10	28	220	248	NS 8-2019	Physics for the fifth grade science	2
10	24	288	312	NS8 -2019	Physics for the sixth grade	3

					science	
29	82	666	748	total summation		

### A - Analysis tool

To achieve the goal of the current research, the researcher has built a tool for analyzing the content of high school science and physics textbooks (TRIZ Principles Standard for Creative Problem Solving). The design research tool is to assist the researcher in the content analysis process, as well as take a standardized approach to the analysis process, data collection, and scoring of iterations. Without it, the content analysis process can be considered improvisational and does not cover aspects of real content and may be influenced by the subjectivity of the researcher. (Hadiya, 2009, 153) The researcher prepared the TRIZ Theory Principles Standard for Creative Problem Solving based on the above and went through the following steps:

1. Studying a number of books, magazines and scientific reports in the field of education, the theory of creative problem solving, and in the field of physics.
2. Presentation of previous studies that presented an analysis of books and physics in general, such as the study (Ghufran 2020), the study (The Age of Patience 2020), and the study (Marwan Al-Khalidi 2017). And a study (Al-Ruwaithi 2001)
3. The researcher conducted an open questionnaire for a group of experts and specialists in physics teaching methods that included identifying some principles of TRIZ theory for creative solutions to problems that should be included in physics books for the preparatory stage.

After reviewing the opinions and answers of arbitrators and specialized experts, the researcher prepared a standard for the principles of TRIZ theory for creative problem solving in its initial form, which consists of (20) the basic principles that included (140) sub-paragraphs of each principle (7) paragraphs.

Validity of the tool: The validity of the tool is the validity of the tool in analyzing the content that the researcher wants to analyze, as the results of the analysis are supposed to be presented to a group of other analysts to ensure that the tool has achieved the purpose for which it was prepared. (Krippendorf, 2018.30-31) The apparent validity of the research instrument (Treez Theory Principles for Creative Problem Solving) in its initial form was verified based on the opinions of a group of experts, specialists and arbitrators in the field of physics teaching methods and physics subject supervisors, and taking into account the observations of the judges on the reformulation and modification of some of the principles of the standard, Where the criterion remained from (7) paragraphs for each principle, and the researcher relied on the percentage of agreement (80%) between the arbitrators, and therefore the research tool gained clear indicators of validity and validity to become in its final form, which consists of (140) paragraphs divided into (20) main principles

### Fourth - b -: Analysis of the content of physics books for the preparatory stage

To analyze the content of physics books for the preparatory stage according to the standard prepared for this research, and after reviewing a group of research and sources that dealt with the content analysis approach, the researcher reached a set of determinants approved in this type of research. . , As follows:

#### The purpose of the analysis

The objective of the analysis in the current research is to find out the extent to which the content of middle school physics textbooks contains the basic principles of the theory of creative problem solving (TREZ theory) according to the research tool prepared for this purpose (TRIZ principles of the theory of creative problem solving theory)

#### The units of analysis used: Usually three modules are used in content analysis:

##### A - Recording unit

:It is defined as the smallest part of the analyzed content by which the content is diagnosed and there are types of scoring units, including words, subject, paragraph and idea (.Abd al-Rahman and Adnan, 2007, 213)The idea was used as a unit of analysis in the current research and was defined (Al-Jadri and Yaqoub, 2009) with a short sentence or short phrase that includes the idea about which the topic revolves (Al-Jadri and Yaqoub, 2009, 217)The idea was used because of its breadth enough to give meaning and from scratch which reduces the possibility of its inclusion in several directions compared to the units greatThird, about the unity of the subject, and the idea consists of two types:

##### B-Explicit idea

A sentence in which the desire or desire for something is explicitly and directly indicated  
Implicit Idea: A series of consecutive and successive psychological events that include a circumstance or behavior to which the individual responds internally or externally, and the resulting physical or social consequences. (Abd al-Rahman, Zangana, 216: 2007)The researcher relied on the explicit idea, the implicit idea, and the unit recording that physics books for the preparatory stage are scientific books, and their phrases are often clear and explicit.

##### C - Unit context

(Content)It is the structure surrounding the recording unit that must be examined for the purpose of arriving at a diagnosis of the recording unit, usually the paragraph or topic in which the idea is located. (Abd al-Rahman and Adnan, 2007, s 214-215).

### D - Counting unit

He refers to it (Atifa, 2002, which is a system for quantitative recording of content units on a regular basis that helps in reconstructing the content in the form of numbers and figures so that the researcher can process them statistically and reach quantitative results). The researcher used the observational census unit and counted the phenomena that express a certain idea that match the indicators of the standard used in the current study for the purpose of giving the appropriate weights to them. In order for the instrument to fulfill the purpose for which it was made, it is used, so it measures what it was designed to measure. 1997, s 61 "(honesty is known as the most important characteristics that the Elseco scale must have in psychological and educational standards (Ebel, 1972, 435) To ensure the validity of the analysis, the researcher chose a sample of the analyzed material, which is a chapter of physics introductory stage for each Book A (Chapter Two) and its presentation with the criteria (the search tool) and the phrases that were recorded as repeating the paragraphs included in the standard fields, the group of arbitrators [1], a specialist in the methods of teaching physics, and then verifying the validity of the analysis process, where the verification form included the following questions:

- Are the paragraphs of the standard clear and comprehensive of the analyzed content?
- Is the process of interpreting the implicit ideas correct?
- Can the results of the analyzed sample be generalized to the entire research community?
- Is the lack of bias of the research tool evident to the researcher in the results of the analyzed content?

It also collected the opinions of the arbitrators about the validity of the analysis process, which called the researcher to consider the validity of the analysis process that she presented. The reliability of the analyzes: the reliability of the analysis: it means that the results are obtained if the analysis process is repeated, despite the same people performing the analysis process, as well as again the difference in the time of the analysis, in order to achieve a high degree of consistency. Drost, 2011, 106) in the stability of "the stability of the measurement results when they are re-applied again to the same sample") Hyena, 2006, 120) In order to objectively analyze and reduce the subjective analyzer and obtain acceptable stability, the researcher calculates the stability in two ways:

1- It does not agree with the passage of time: it is to obtain the same results after re-analysis and during a certain period of time (Bahri, 2012, 202) to calculate the stability coefficient in this way, the researcher repeated: the analysis process for the random sample that decides to measure the stability of the analysis, which is a physics book for the third grade With an average of (167) pages after a time period of 30 days from the first analysis.

2- An agreement between the analysts: It means that each of them should reach the same results when applying the same categories and units of analysis to the same content or content that was analyzed. The researcher analyzed the same material with other analysts to repeat the analysis process after giving them copies of books and attaching the research tool (TRIZ principles standard for creative problem solving) and showing the steps of the analysis and then settling between the analysts. It was calculated using the Holst equation.

Table No. (4) (Evaluation of reliability coefficients between and with the researcher over time and other analysts.

Stability coefficient values	Stabilizers	Stability type
90%	researcher with herself after) 30The day of the first analysis	Agreement over time
84%	Senior Researcher and Analyst	
86%	The second researcher and analyst	via analysts
92%	Analysts among themselves	

According to (Lombard et ail, 2002) the amount of acceptability and reliability in the stability ranges (0.70 - 0.90), so through the results presented in the above two tables it was found that the analysis tool has achieved a high stability coefficient. He invites us to trust him (criterion of principles of creative problem-solving theory). (TRIZ) stability is good.

#### \*Statistical means or psychometric properties: Statistical means

The researcher used different statistical methods in processing the data of ratios and frequencies used for the results of the content analysis and Holst equation.

$$CR = \frac{2M}{N1 + N2}$$

- CR:coefficient of stability.
- M The number of categories agreed upon between the researcher and himself or between him and the other researcher
- N1 :The total of the categories analyzed by the first researcher.
- N2 :The sum of the categories analyzed by the second researcher.
- N1 +N2 :The sum of the categories analyzed by the first and second researchers.

### Chapter Four: Presentation and interpretation of the results

This chapter presents, discusses, and interprets the results of the research in relation to the purpose of the research, which is to include the principles of TRIZ theory for creative problem solving in the content of middle school physics textbooks. And then reach the conclusions and make recommendations and suggestions that the researcher reached through the results of her research, which are:

**Findings related to the purpose and interpretation of the research:**

The extent to which preparatory physics textbooks contain the principles of TRIZ creative problem solving theory:

To reveal the extent to which middle school physics textbooks contain the principles of TRIZ's creative problem-solving theory, the researcher used a content analysis tool she created to analyze the content of middle school physics textbooks.

Table (4) explains the frequencies and percentages of the TRIZ principles included in the 4th grade Physics of Science textbook

Percentage of repetitions of each principle	Total repetitions	Repetitions of indicators							pointer principles	sequence
		Seventh Indicator	The sixth indicator	Fifth indicator	Fourth indicator	The third indicator	second indicator	The first indicator		
10%	860	164	zero	zero	78	zero	272	346	partition (fragmentation)	1
6%	480	zero	135	49	zero	zero	296	zero	extraction	2
4%	390	zero	zero	zero	75	158	101	56	spatial quality	3
3%	310	52	90	50	10	47	Zero	61	linking (merging)	4
4%	390	100	114	zero	59	zero	21	96	dynamic flexibility	5
4%	three hundred fifty	3	43	117	78	97	12	zero	general	6
3%	270	zero	zero	215	55	zero	Zero	zero	Preliminary countermeasures	7
5%	430	zero	92	101	zero	75	68	94	Tribal preparatory actions	8
5%	420	108	88	76	zero	63	Zero	85	Pre-confrontation of imbalances	9
3%	280	zero	53	zero	68	56	103	zero	Equal voltage	10
2%	210	61	52	92	zero	zero	Zero	5	the other dimension	11
2%	150	zero	71	zero	zero	zero	29	50	shift work	12
8%	740	137	101	129	zero	143	Zero	230	work continues	13
4%	320	zero	105	zero	98	117	Zero	zero	rapid rush	14
2%	205	zero	52	88	zero	zero	36	29	Convert harmful	15th
10%	882	10	57	72	158	273	177	135	Feedback	16
8%	680	78	203	8	112	97	54	128	mediation	17
9%	750	zero	zero	202	97	187	101	163	self service	18
2%	195	74	zero	42	46	zero	33	zero	thermal expansion	19
6%	520	zero	106	88	zero	97	151	78	Characteristics change	20
100	8796	787	1362	1329	934	1410	1454	1556	Total	

Table (5) Shows the achieved indicators for each principle and its percentage compared to the spoken percentage of the physics book for the fourth scientific grade.

Oral ratio	The percentage of inclusion in the fourth scientific book	Percentage of indicators achieved	The number of indicators achieved	Number of sub-indicators	Indications principles	sequence
%70	%64	57.0	4	7	division or fragmentation	1
		43.0	3	7	Separation or extraction	2
		57.0	4	7	spatial quality	3
		86.0	6	7	linking (merging)	4
		71.0	5	7	dynamism (flexibility)	5
		86.0	6	7	general (comprehensive)	6
		29.0	2	7	Preliminary countermeasures	7
		71.0	5	7	Tribal preparatory actions	8
		71.0	5	7	Pre-confrontation of imbalances	9
		57.0	4	7	Equal effort (variance reduction)	10
		57.0	4	7	the other dimension	11
		43.0	3	7	Periodic work	12
		71.0	5	7	Continuing useful work	13
		43.0	3	7	Jump or dash	14
		57.0	4	7	Converting harmful into beneficial	15
		1	7	7	Feedback	16
		1	7	7	mediator or mediation	17
		57.0	4	7	self service	18
		57.0	4	7	thermal expansion	19
		71.0	5	7	Characteristics change	20
		64.0	90	140	Total	

It is evident from Table No. (5) and Figure 1 (above that the physics book for the fourth grade in science, which reached the number of pages analyzed) 158 (documented pages) (8796) is widely distributed on twenty creative principles. Problem. - Solve the theory with an average of (140) indicative and clear from 4.5 tables (above and figure) (1) the principle of feedback came first in terms of the number of iterations (882). (Ratio 1) the case of the division principle in second place got (860 (repeated and four paragraphs) 57.0). (57.0) as for the principle of work continuity, it came in fourth place, and its recurrence was high. (740) (recurrence) 5 (ratio of paragraphs) (71.0) as for public relations, one mediation came in the fifth rank and its frequency was (680) (repetition and all its paragraphs were achieved by (1) and in the sixth). The place came up with the principle of changing characteristics whose frequency reached 520 (repeat). and verification) 5 (percentage of paragraphs) (71.0) as for the chapter and conclusion, three paragraphs have been completed in it 43). (Achieving (480 repetitions until it reached the seventh rank, followed by the principle of tribal preparatory procedures by repetition)) (430) (repetitions achieved) 5 (paragraphs ratio) (71.0) Eighth rank: The principle of pre-confrontation with imbalances came in the ninth rank. It ranked the number of repetitions (420) repetitions, and it achieved (5) (paragraphs ratio) (71.0) and the principles of spatial quality and dynamic flexibility, it ranked tenth. Repetition and validation of spatial quality (4) the items were achieved with a score of (57) 0 dynamics. 5 (percentage of paragraphs) (71.0), and the number of repetitions of the general principle that came in the eleventh position was about (three hundred and fifty (repetition and recording) 6 (percentage of paragraphs) (86.0), followed by the rapid rush the number of repetitions reached (320) 3 (percentage for paragraphs)) (43.0) and in the twelfth place the principle of inclusion (310 (repetition of the thirteenth rank) 6 (ratio of paragraphs) 86.0), then came in the twelfth rank. 14th Place Equal Effort Principle Its Repetitions (280 (repeatedly verified) 4 (paragraph ratio) (57.0) For Countermeasures Principle, its iterations (270 (achievement) from two indicators frequently is 29.0), rank 15, Dimension The main one for the other is 16 (with 210 (repeatedly checked)) 4 (paragraph ratio) 43.0 The harmful-to-beneficial conversion principle is ranked 17 with a number of iterations around (205) (checked k) 4 (paragraph ratio) (43.0), where Thermal expansion principle (195) was repeatedly ranked 18th, the items achieved are (4 (43.0 percent item), the last working period principle was 19th max.(150) see 3 (ratio items)) indicated The researcher, through the above-mentioned results, indicated that the number of indicators to validate the principles of the theory of creative problem solving in TRIZ in the fourth scientific book was (90). The remainder of the total number of numerical indicators (50) was not investigated, and there are indications that received little redundancy, despite their importance to students at this stage of the study.

When comparing the extracted inclusion rate of the fourth grade physics textbook (64%) (with an expert-approved spoken inclusion rate) (70%) we note that it is lower than the stated percentage, meaning that the fourth grade physics textbook does. It does not incorporate the principles of TRIZ's creative problem-solving theory.

Results of the analysis of the physics book for the scientific application of the fifth grade: To verify the goal of the research, the researcher analyzed the content of the physics book for the fifth grade in applied sciences, which consists of (220). The results were as in Table No. (6) And Table. (7) And Figure (2)

Table No. (6) Shows the frequencies and ratios of the principles of TRIZ theory included in the physics textbook for the fifth grade in applied sciences.

Percentage of repetitions of each principle	Total repetitions	Repetitions of indicators							pointer principles	sequence
		Seventh Indicator	The sixth indicator	Fifth indicator	Fourth indicator	The third indicator	second indicator	The first indicator		
9%	870	160	zero	zero	95	130	131	354	partition (fragmentation)	1
6%	580	zero	63	125	Zero	111	187	83	extraction	2
%4	390	zero	3	zero	75	148	101	63	spatial quality	3
4%	410	72	92	25	zero	58	95	68	linking (merging)	4
5%	490	81	87	57	55	102	zero	108	dynamic flexibility	5
9%	840	8	145	205	150	125	85	122	General	6
2%	180	zero	63	36	51	zero	zero	30	Preliminary countermeasures	7
4%	420	zero	85	57	zero	97	71	110	Tribal preparatory actions	8
4%	430	zero	75	93	52	65	zero	147	Pre-confrontation	9
4%	370	zero	130	zero	63	58	120	zero	Contrast reduction	10
3%	273	78	25	140	zero	13	zero	17	the other dimension	11
3%	250	zero	64	27	zero	zero	79	80	shift work	12
8%	770	145	85	160	zero	125	55	200	work continues	13
3%	310	zero	127	zero	66	72	zero	45	rapid rush	14
3%	305	zero	93	113	zero	zero	40	57	Convert harmful	15
9%	850	3	103	124	109	230	121	187	Feedback	16
9%	854	46	185	25	103	210	55	230	Mediator	17
4%	420	zero	zero	124	55	96	50	95	self service	18
2%	180	85	zero	27	29	zero	zero	39	thermal expansion	19
5%	530	zero	130	100	zero	85	110	105	Characteristics change	20
100%	9722	678	1555	1438		1725	1300	2140	Total	

Table (7) it shows the achieved indicators for each principle and its percentage compared to the stated percentage

Physics book for the fifth grade of applied science.

Oral ratio	The percentage of inclusion of the fifth applied book	Percentage of indicators achieved	The number of indicators achieved	Number of sub-indicators	Indications principles	sequence
		71.0	5	7	division or fragmentation	1

70%	74%	71.0	5	7	Separation or extraction	2
		71.0	5	7	spatial quality	3
		86.0	6	7	linking (merging)	4
		86.0	6	7	dynamism (flexibility)	5
		57.0	4	7	general (comprehensive)	6
		71.0	5	7	Preliminary countermeasures	7
		71.0	5	7	Tribal preparatory actions	8
		71.0	5	7	Pre-confrontation	9
		57.0	4	7	Equal voltage	10
		71.0	5	7	the other dimension	11
		57.0	4	7	Periodic work	12
		86.0	6	7	Continuing useful work	13
		57.0	4	7	Jump or dash	14
		57.0	4	7	Converting harmful into beneficial	15
		1	7	7	Feedback	16
		1	7	7	mediator or mediation	17
		71.0	5	7	self service	18
		57.0	4	7	thermal expansion	19
		71.0	5	7	Characteristics change	20
		74.0	103	140	Total	

It is clear from Table (6), Table (7) and Figure (2) that the total number of iterations achieved in the Physics Book for the Fifth Applied Scientific Category (9722 iterations of achieving the principle of (divide and part)) ranked first. . The rank in which the number of repetitions reached (870,000 for the paragraphs that achieve this principle, are: 5) and (71.0), followed in the second place by the principle of the mediator whose frequencies reached (840). As for the principle of feedback, it came in the third place, and its repetitions are about (850), and all paragraphs were checked by (1), and the general principle came with a number that achieved repetition, which is (840 (fourth) verified) 4 (paragraphs and percentages) 57.0. As for the principle of continuity of work, it reached the fifth rank, and the number of its repetitions reached (770 (repeated. Verified) 6 (paragraph percentage of the graphs) 86.0), and the principle of separation or extraction got (580 (repeated. The sixth rank as an investigator) 5 (Percentage) for paragraphs (71.0), and the principle of changing the properties of the seventh rank according to the frequency of the principle (530 (repeatedly verified) reached 5 (percentage of paragraphs) 71.0, followed by the principle of dynamics (flexibility) in the eighth rank, and the vocabulary achieved in it reached ( 6) and (86.0 for the introductory principle) - counteracting imbalances, their frequencies have reached 430) (repeatedly verified). ) 5) paragraphs by 71.0. And he got the ninth rank, and the principle of tribal preparatory procedures and the principle of self-service both obtained (420) recurrences and verification of each of them) 5 (paragraphs ratio) 71.0, thus they reached the tenth rank, and the principle. From embedding. Been achieved. 410) was repeatedly verified (6) (ratio of paragraphs) 8600) and it is in the eleventh place, followed by the principle of spatial quality, which came in the twelfth place and achieved a number of iterations (390) and achieved by (5) items with a percentage of 71.. 0) The variance principle was obtained on the basis of the reduction principle (370 (repeated, thirteenth rank and achieved) 4) paragraphs by 57). From it) 4) paragraphs by 57.0), followed by the principle of transforming the harmful into the beneficial in the fifteenth rank, where the repetition reached (305 (repeatedly verified) 4) paragraphs by 57.0, while the other dimension was in the fifteenth rank. The sixteenth rank, and the repetitions of this principle amounted to about (273 (repeatedly verified) 5) paragraphs with a percentage of 71.0), and the principle of periodic work ranked seventeenth and was achieved (4 (verified) by 57.0), and finally. Thermal (primary counting and stretching actions) principles, ranked last 19 with maximum number of repetitions (180 (repeatedly verified for preparatory countermeasures) 5) items by 71.0) and thermal expansion check (4) by 57 items. .

Tables (13) and (14) and Figure (5) (above) have shown that the principle of feedback and the principle of mediation or mediation have obtained the highest percentage of inclusion and achieved (7 items each). The principle that got the highest iterations is the principle of division (segmentation), where the number of iterations was (870 iterations), but the least iterations were for the principles of primary countermeasures and the principle of thermal expansion). (180 (frequently for the least achievement of the paragraphs are the above-mentioned principles that have been achieved) 4 paragraphs for each, and the researcher noted through the above-mentioned results that the number of indicators achieved for the TRIZ principles amounted to the theory of creative problem solving in the fifth applied scientific book about (103), As for the unrealized paragraphs, they reached (37) graphs, and there are indicators that got little repetition despite their importance to students at this school stage, and when. By comparing the percentage of integration extracted for the fifth grade from the book of applied sciences (74%) (With a practical inclusiveness rate) AP) and proven by experts and the amount

is (70%), and we note that it is greater than the spoken percentage. The researcher attributes the reason for this to the nature of the content of the physics book for the fifth grade in applied sciences, where the content of the scientific material is understandable.

### Results of the analysis of the physics book for the sixth grade of applied science

The results of analyzing the content of the physics book for the sixth grade of applied science were as shown in the table (8) and the table (9)

Table (8) Explains the frequencies and percentages of Tees' theory principles for creative solving problems included in the applied science sixth grade physics book.

Percentage of repetitions of each principle	Total repetitions	Repetitions of indicators							pointer principles	sequence
		Seventh Indicator	The sixth indicator	Fifth indicator	Fourth indicator	The third indicator	second indicator	The first indicator		
11%	1471	190	zero	270	190	181	170	470	partition (fragmentation)	1
4%	610	41	89	138	Zero	87	140	115	extraction	2
4%	584	zero	5	27	107	176	185	84	spatial quality	3
5%	715	118	108	86	97	102	95	109	linking (merging)	4
4%	490	74	101	35	75	55	70	80	dynamic flexibility	5
6%	754	3	63	250	120	125	96	97	general	6
2%	338	zero	203	zero	105	30	zero	zero	Preliminary countermeasures	7
7%	910	43	68	143	zero	270	141	245	Tribal preparatory actions	8
4%	509	110	135	95	52	zero	zero	117	Pre-confrontation	9
6%	885	zero	300	78	140	135	176	56	Equal voltage	10
3%	315	59	15th	140	zero	zero	56	45	the other dimension	11
2%	three hundred fifty	35	142	46	zero	25	50	52	shift work	12
4%	610	36	136	187	zero	98	65	88	work continues	13
3%	466	zero	215	zero	125	93	zero	33	rapid rush	14
3%	438	zero	217	95	zero	zero	65	61	Convert harmful	15
9%	1296	35	205	190	254	250	185	177	Feedback	16
7%	996	87	100	32	275	195	127	180	Mediator	17
7%	907	zero	zero	290	87	127	151	252	self service	18
3%	395	195	45	73	84	zero	zero	98	thermal expansion	19
6%	768	59	158	179	zero	208	256	70	Characteristics change	20
100%	13807	1085	2305	2354	1711	2157	2028	2429	Total	

Table 9 shows the achieved indicators for each principle and its percentage compared to the spoken percentage of the physics book for the sixth grade of applied science.

Oral ratio	The percentage of inclusion of the sixth book	Percentage of indicators achieved	The number of indicators achieved	Number of sub-indicators	Indications principles	sequence
		86.0	6	7	division or fragmentation	1
		86.0	6	7	Separation or extraction	2

70%	81%	86.0	6	7	spatial quality	3
		1	7	7	linking (merging(	4
		1	7	7	dynamism (flexibility(	5
		1	7	7	general (comprehensive(	6
		43.0	3	7	Preliminary countermeasures	7
		86.0	6	7	Tribal preparatory actions	8
		71.0	5	7	Pre-confrontation	9
		86.0	6	7	Equal voltage	10
		71.0	5	7	the other dimension	11
		86.0	6	7	Periodic work	12
		86.0	6	7	Continuing useful work	13
		57.0	4	7	Jump or dash	14
		57.0	4	7	Converting harmful into beneficial	15
		1	7	7	Feedback	16
		1	7	7	mediator or mediation	17
		71.0	5	7	self service	18
		71.0	5	7	thermal expansion	19
		86.0	6	7	Characteristics change	20
		81.0	114	140	Total	

It is clear from Table No. (8) and (9) and Figure No. (3) that it was previously mentioned that the physics book for the sixth grade in applied sciences, whose pages were analyzed, amounted to about 288 (verified) 13807. More than twenty principles of the TRIZ theory were distributed to solve Creative problems, where the principle of division got the largest number of iterations, reaching (1471 (repetitions) 6 (percentage of paragraphs) 86.0), followed by the principle of feedback, which ranked second. In the number of repetitions b) 1296 (repeatedly) where all paragraphs are examined at a rate of (1), and the mediator principle came in third place and got a number of repetitions amounted to (996). Also, all its paragraphs were completed and their proportions were fulfilled as in the previous principle. As for the principle of tribal preparatory procedures, it ranked fourth and the number of repetitions was about (910 (verified repeatedly) 6 (paragraph 86.0), and the principle of self-service got (907 (repeated)) 5 paragraphs with a percentage of 71.0) and the fifth rank, followed by the principle of equivalence of effort, which was repeated 885 (which reached the sixth rank when achieved) 6 (paragraphs) 86.0) and in the seventh rank came the principle of changing characteristics, which was repeated (768) and achieved 6 (paragraphs by a percentage) 86.0, and in the eighth place came the principle of generality, which was achieved (754). Time and again all the paragraphs were checked, and as for the principle of linking or merging, it ranked ninth and its repetitions reached (715). As for their verified percentages, they were all at a rate of (1), and the principles of (extraction and continuity) for useful work ranked tenth in the number of repetitions, which amounted to (610 (repetitions for each). 6 paragraphs with a rate of 86).0. As for the eleventh rank, it was for the principle of spatial quality, whose repetitions amounted to (584), as well as making it (6) paragraphs with a percentage of 86.10 and its completion (5) paragraphs with a percentage of 71 (.0), followed by the principle of dynamism and flexibility, in the thirteenth place, and its iterations (490). (Repeatedly, checking all paragraphs with a percentage of 1), then the principle of rapid rush, which reached (446) (repeated), 4 (paragraphs) 57.0, the principle of transforming harmful into beneficial came in the fifteenth rank, amounting to (438 (repeated) and also achieved (4) paragraphs (57.0), while thermal expansion ranked sixteenth. With a number of severe repetitions (395 (verified repeatedly) (5) items with a percentage of 71.0), with regard to the principle of cyclic action, the repetition (three hundred and fifty) repetitions and the seventeenth rank, which is achieved (6) items 86) .0) and followed by The principle of public relations exclusionary participation, the number of procedures in which the number of procedures reached 3 (paragraphs ratio) (338 (repeated), and thus ranked eighteen and achieved) 43.0 Finally, the principle of the other dimension came in the nineteenth rank and has a degree (315) (verified frequently)) 5 (paragraphs 71.0) It was noted through the above results that the number of indicators of verification of the principles of TRIZ theory for creative problem solving in the sixth-grade applied science book reached for the researcher (114 (paragraphs from the original) 140 (ie) 26 (paragraphs) that were not investigated, and when comparing the comprehensiveness ratio Extracted from the sixth grade book in applied sciences (81%) The spoken percentage of inclusion of experts is (70%). We note that its determination is greater than the spoken percentage. This means that the principles of TRIZ creative problem solving theory are included in the sixth grade physics book in applied sciences.

## Conclusions

Through the research results, the researcher reached the following conclusions:

1. Physics textbook for class VI of applied sciences is most concerned with the principles of TRIZ creative problem solving theory and has achieved the highest number of iterations and an overall rate (81%) compared to spoken relativity (70%)
2. The principle of feedback ranked first in physics books in achieving the highest number of repetitions, and the lowest principle in achieving repetition is thermal expansion.
3. Middle school physics textbooks did not ignore any of the principles of TRIZ creative problem-solving theory, which means that all the principles were fulfilled in different proportions, but they neglected many of the standard TRIZ pointers designed to achieve the goal of standard TRIZ theory. Research despite the importance of these indicators for learners in the preparatory stage.

## Recommendations

In light of the results, the researcher recommends the following:

1. Include in physics books for the secondary stage the principles of creative solving theory for non-existent problems
2. Work on preparing and qualifying physics teachers before and during their service on the principles of TRIZ creative problem solving theory.
3. Preparing a guide for physics teachers for the preparatory stage on the necessity of teaching the subject in light of the principles of TRIZ theory to solve creative problems.
4. Establishing training programs and seminars for physical physics teachers to familiarize them with the principles of creative problem-solving theory and how to develop students.

## Suggestions

To complete this study, the researcher suggests the following:

1. Conducting a similar study to analyze the content of high school biology, chemistry and mathematics textbooks in light of the principles of TRIZ theory of creative problem solving.
2. Conducting a similar study to analyze the content of science books for the primary stage in light of the principles of TRIZ theory.
3. Conducting a comparative study of science and physics books taught in secondary school in Iraq and science and physics books that will be taught in Arab countries. Or non-Arabic about the contents of the principles of creative problem-solving theory.

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**Author Information**

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**Prof. Muhsen Taher Muslem Al-Mousawi**

College of Education, University of Al-Qadisiyah,  
Iraq

**Maryam Khudair Farhan**

College of Education, University of Al-Qadisiyah,  
Iraq

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